

Computer Science 510 – Computational Finance
Prof. Steven Skiena
Fall 2008

Semester Project

Proposal due: Thursday, October 9, 2008

Progress report: Thursday, November 6, 2008

Project/Presentation done by: Thursday, December 4, 2008

September 17, 2008

The project will involve some concentrated work in one or more research project related to computational finance. Below I list several projects. You might also choose your own topic if you can *convince me* that what you want to do is interesting.

I have intended the project descriptions to be detailed enough about the initial stages that you can get to work quickly. Of course, do not hesitate to come by to talk to me if you need more information. Some of the projects may seem to be of fairly short term duration, but I anticipate that more substantial issues will arise after you start working on them.

Each project will be done by only one group, and projects will be assigned in a more or less FIFO order. Each project should be done by a group of from 2-3 students, with a few exceptions higher. Each group is responsible to turn in a 1-2 page project proposal as of the date above. I will award 15% of the project grade on the strength of the progress reported in the proposal. This is to encourage doing some reading (at least on the web) early and to make sure that you and I both know what you are to do before it is too late to avoid trouble. The projects I believe are best have been starred (*). **I strongly recommend you and your group pick a starred project or a presentation.**

Many of these projects start with a literature search. Look in at least three places (a) Google, (b) books/journals in the University library system (*ask* a librarian), (c) the Journal of Finance (old back issues are available online on JSTOR, www.jstor.org/journals/00221082.html) *Try to find scholarly material – not just commercial hype.*

TextBiz/Infrastructure

1. (*) *Rapid Response Team* – These students will be responsible for generating simple reports on the price behavior of securities, and presenting them in class by the meeting after the question is announced.

Their first job is to get familiar with what financial databases/resources are available from the business school and our own textbiz database.

THIS GROUP IS ALREADY FILLED UP

2. (*) *Trading Contest/Simulation Infrastructure* – I would like to see us develop a program trading system which can compete in one or more on-line trading competition.

- First identify the appropriate competitions / forums. The possibilities include the Virtual Stock Exchange from MarketWatch, Iowa Electronic Market (Politics), Hollywood Stock Exchange, Trade Sports (one week)

- (*) Develop the necessary infrastructure /API for us to interface with the contest (three weeks)
- Develop trading strategies to compete in this contest.

Optimization/Analysis

3. (*) *Buying Strategies for Exploiting Predictions* – Suppose we have identified a probability distribution predicting the prices a given stock as a function of time. Develop an algorithm/program which takes this probability distribution, a profile of permitted risk, and the current prices of available securities, and proposes the best strategy to invest to exploit the probability distribution.
4. (*) *Combining Options to Match a Desired Payoff Schedule* – Suppose you want to construct a particular hedge where you have a desired payoff function as a function of price and time. Develop an algorithm/program which takes this payoff function and the current prices of available securities, and proposes an optimal strategy to invest to approximate this function. These algorithms likely involve some computational geometry and/or linear/mathematical programming optimization.
5. (*) *Time Series Data Mining* – This project seeks construct a library of routines for large-scale time series matching and pattern recognition.
 - Simplify time series to low dimensional representations.
 - Cluster time series by similar shape
 - Find similar time series to an input prototype.

(*) Presentation Topics:

Certain groups will give (as their course project) presentations to provide practical information about available databases, software, and other resources. Each group presentation will last 20 minutes (including questions) and require the construction of a webpage with additional reference / tutorial material.

These presentations will be scheduled appropriately in the course material, and provide an excellent way for students to complete the course project prior to the end of the term.

Details for each presentation were provided on the syllabus!

- Prediction Markets: Iowa Electronic Market, Hollywood Stock Exchange, Trade Sports, ???
- Options Pricing Software
- Options Markets:
- The R Statistics Library:
- Backtesting and Trading Simulations:
- CRSP
- RiskMetrics
- Reuters 3000 Xtra